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Post-Rehabilitation Evaluation of the Sanitary Sewer System at Lawrence Livermore National Laboratory (How Do You Declare Environmental Victory)

Erich R. Brandstetter, Ph.D., Environmental Scientist
(510) 424-4961
Robert J. Vellinger, Environmental Analyst (Speaker)
(510) 422-7382
Fax (510) 422-2748
Lawrence Livermore National Laboratory
Post Office Box 808, L-629
Livermore, CA 94551

Lawrence Livermore National Laboratory (LLNL) is operated by the University of California under contract with the U.S. Department of Energy. The Livermore Main site occupies 819 acres approximately 50 miles southeast of San Francisco.

The goal of the Sanitary Sewer System Master Plan for LLNL is to provide a reliable system to meet present and future wastewater flow requirements economically and in compliance with appropriate laws and regulations. As the first step, the existing sanitary sewer system was studied to determine its adequacy to accommodate present and future peak flows. A set of alternatives was developed to address deficiencies found during the analysis phase. In Part 2, a specific plan for upgrading the sanitary sewer collection system was prepared.

Sanitary sewer flow monitoring was conducted in the LLNL collection system for a 5-week period from December 1, 1988, to January 6, 1989. The LLNL study area was divided into eight drainage basins using ten flow monitors. The flow program was designed to determine the flow characteristics within the study area. Flow components, including sanitary flow and infiltration/inflow (I/I), were evaluated at each location. From the data obtained, design flows were developed for existing and future conditions to assess the adequacy of the collection system for several development scenarios. Design flows included peak sanitary baseflow and an I/I allowance. Wastewater flow was determined for existing conditions and 5-year and 20-year future estimated conditions.

The average baseflow (ABF) at each flow monitoring site was developed by analyzing monitored flow data from dry days. A complete 7-day baseflow hydrograph was developed for each basin to account for variable water usage and the resulting discharge during the weekdays and weekends. We determined that ground water infiltration was not present in the LLNL collection system. Rainfall-dependent infiltration/inflow (RDI/I) for a given event was determined by subtracting the average dry-weather baseflow from the wet-weather hydrograph.

A hydraulic model was used to evaluate the data collected during the 5-week period. Model runs for current and future dry weather scenarios showed no capacity deficiencies in the existing collection system, but a number of deficiencies were identified by the hydraulic model for all three peak wet-weather runs.

The Sanitary Sewer Rehabilitation ($5M) Project proposed specific design solutions for the rehabilitation of the sanitary sewer piping system identified above. The result was aimed at compliance with California's Porter-Cologne Water Quality Control Act, which prohibits the discharge of any waste to the environment that may potentially have adverse impacts on the quality of waters of the State, as well as federal and local requirements. The initial project design was based on an in-depth analysis of existing closed-circuit TV data, flow monitoring data, and water balance investigations. The rehabilitation plan targeted areas with the highest exfiltration potential. Over 130 point repairs were completed, 24,000 linear feet of sewer mains and laterals were inversion lined, 42 lateral lines were replaced, and 150 cleanouts and 10 new manholes were installed for site-wide access.

The primary goal of the current project is to evaluate the effectiveness of the rehabilitation effort and define how to declare victory from an environmental perspective. We will collect flow data from the same ten locations used in the 1989 study, over a similar 5-week period. The data will be used to determine current dry-weather hydrographs and RDI/I. We will develop a hydraulic model for current conditions, and peak wet-weather flow scenarios used in the 1989 study will be repeated using the current model. The effectiveness of the rehabilitation effort can be quantified by the amount of reduction in RDI/I and by the ability of the system to handle maximum predicted capacity.

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